

Effects of smoking and exposure to environmental tobacco smoke on hemoglobin adducts of tobacco-specific nitrosamines

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The tobacco-specific nitrosamines N-nitrosornicotine (NNN) and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) form a common adduct with hemoglobin which releases 4-hydroxy-1-(3-pyridyl)-1-butanone (HPB) on mild alkaline hydrolysis. This adduct has been proposed as a biomarker for tobacco smoke exposure. HPB-releasing hemoglobin adduct levels are two-fold higher in adult smokers and 13-fold higher in nasal snuff users compared to in nonsmokers (Falter et al. Clin. Investig. 72:364, 1994). A similar 2-fold difference in HPB-releasing hemoglobin adduct levels is evident in smoking and nonsmoking pregnant women (Branner et al. Biomarkers 3:35, 1998). In nonsmoking pregnant women, self-reported exposure to environmental tobacco smoke (ETS) was not associated with a significant increase in HPB-releasing hemoglobin adduct levels. The rather high background level of HPB-releasing hemoglobin adducts in nonsmokers (27 ± 4 fmol/mg globin) is postulated to originate from sources other than tobacco smoke. This hypothesis is supported by observations that (i) in vitro nitrosation of myosmine, a minor tobacco alkaloid also present in the diet (Zwickenpflug et al. J. Agric. Food Chem. 46:2703, 1998), forms NNN and HPB, and (ii) HPB-releasing DNA and hemoglobin adducts are detected in rats following administration of myosmine in the diet. [This work was partially funded by the German Research Council for Smoking and Health]